

The future of the semiconductor industry aligns with TSN

02 August 2022

The production of semiconductors is vital to nearly all modern technologies, helping to drive key breakthroughs in the digitalization of industries and in our daily lives. To help manufacturers deliver high-quality products and ultimately growth under these favorable circumstances, vendors of industrial automation devices should offer cutting-edge solutions leveraging Time-Sensitive Networking (TSN). TSN is key to helping companies futureproof their operations, maximize throughput, productivity, precision and accuracy, as it is the enabling technology for an industry that needs guaranteed data reliability, integrity and high performance.

Tom Burke, Global Strategic Advisor at CLPA, looks at how automation specialists serving the semiconductor industry can drive the sector forward with TSN.

The U.S. is a global leader in semiconductor R&D, chip design, fabless firms as well as integrated device and microprocessor manufacturing, with American companies having a combined share of almost 50% of total global semiconductor sales.¹ These businesses are also among the most automated, with the sector even surpassing automotive as the largest customer of industrial robots, with approximately 109,000 new units purchased globally in 2020 alone.²

As the acceptance of automation technologies in semiconductor manufacturing is a given, device vendors serving this sector can therefore take advantage of these favorable conditions. To drive their customers' success even further while growing their market share, it is crucial for companies to offer advanced, highly competitive

solutions that can address the semiconductor industry's current as well as future challenges and needs.

Data transparency for responsive, quality-driven manufacturing

Fabs and other sector-specific manufacturing facilities have a track record of pushing the performance boundaries of automation and smart manufacturing when it comes to semiconductor production. With every technological step forward, they are getting closer and closer to creating truly flexible, autonomous and responsive infrastructures. These can independently run entire processes, self-optimize their performance and adapt to varying conditions in real time. Therefore, the first aspect that vendors should deliver with any automation technology destined for the semiconductor industry is maximized performance.

In addition, producers of chips and other electronic equipment need to ensure maximum precision and accuracy, operating under stringent environmental conditions to deliver high-quality products. Effective track and trace systems that can monitor the movement of resources and goods across factories as well as the entire supply chain are also needed. To succeed in this, it is crucial to set up a network that, in addition to deterministic performance capabilities, can also support higher enterprise-level systems for robust material tracking and tracing throughout the entire production line and beyond. Ultimately, what semiconductor manufacturers require is a network technology to enable the highly effective convergence between the operational technology (OT) and information technology (IT) domains.

Automation devices with TSN advance semiconductor manufacturing

TSN is ideal to address these needs, as this technology was developed to enhance industrial Ethernet so that it could merge disparate types of data traffic. In effect, thanks to TSN functions, it is possible to support additional standard protocols, such as Transmission Control Protocol/Internet Protocol (TCP/IP). More precisely, by providing guaranteed data transport with bounded low latency, networks based on TSN are able to transfer best-effort traffic as well as mission-critical data in a timely manner.

This innovative technology delivers these benefits by enabling advanced time synchronization, traffic shaping and scheduling methods for traffic prioritisation, as set out in the IEEE 802.1 Ethernet standards. In particular, the new clock synchronization can support high-speed, extremely accurate and deterministic operations on the shop floor, such as motion control. At the same time, traffic prioritization enables the network to feed different systems with either real-time traffic or best effort traffic.

Given these key benefits, the positive impact that the application of TSN to automation products can have in driving up the competitiveness of users as well as developers is clear. More precisely, vendors offering TSN-enabled solutions can meet current and future market needs while advancing the performance of their devices.

CC-Link IE TSN supports future-oriented devices for fabs

Selecting the right network technology is crucial to helping vendors deliver truly future-oriented devices. When companies opt to use CC-Link IE TSN for their products they can offer TSN functions and benefit from additional advantages. Most notably, this is the first open industrial Ethernet that combines gigabit bandwidth and TSN. As a result, in addition to traffic synchronization and scheduling, the

technology also supports today's Ethernet speeds such as 1Gbps transmission rates. This is key to facilitating the prompt, simultaneous transfer of large volumes of IT and OT data from different assets.

CC-Link IE TSN was also designed to provide a broad development ecosystem. Thus, vendors can leverage the tools that are best suited to address their specific needs, in terms of end product performance as well as time, resources and investment. Thanks to these features, automation specialists that leverage CC-Link IE TSN can maximize the opportunities available in the semiconductor sectors, helping to drive the industry forward.

¹Semiconductor Industry Association (SIA) (2021) 2021 State of the U.S. Semiconductor Industry. Available at: <https://www.semiconductors.org/wp-content/uploads/2021/09/2021-SIA-State-of-the-Industry-Report.pdf>

²International Federation of Robotics (2021) Executive Summary World Robotics 2021 Industrial Robots. Available at: https://ifr.org/img/worldrobotics/Executive_Summary_WR_Industrial_Robots_2021.pdf

Image captions:



Image 1: To help semiconductor manufacturers deliver high-quality products and growth, vendors of industrial automation devices should offer cutting-edge solutions leveraging Time-Sensitive Networking (TSN).

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About The CC-Link Partner Association (CLPA)

The CLPA is an international organization founded in 2000, now celebrating its 20th Anniversary. Over the last 20 years, the CLPA has been dedicated to the technical development and promotion of the CC-Link open industrial network family. The CLPA's key technology is CC-Link IE TSN, the world's first open industrial Ethernet to combine gigabit bandwidth with Time-Sensitive Networking (TSN), making it the leading solution for Industry 4.0 applications. Currently the CLPA has over 4,100 corporate members worldwide, and more than 2,000 compatible products available from over 370 manufacturers. Around 38 million devices using CLPA technology are in use worldwide.

Anyone interested in joining the organization can apply here:

<https://www.cc-link.org/en/clpa/members/index.html>

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